Peripheral Joint Mobilizations Featuring HVLA Techniques

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Course Outline

Class Component

- Introduction & Objectives
- Overview of High Velocity Low Amplitude mobilization
- Indications and Contraindications for Mobilization
- Joint Mobility Testing
- Tips for problem solving
- Case Review
- Questions and Open Discussion

Course Outline

Upper Extremity

- Shoulder
  - Glenohumeral Distraction Mobilization
  - A/C Distraction Mobilization
- Wrist
  - Scaphoid/Lunate/Capitate Mobilization
  - Thumb CMC Distraction Mobilization

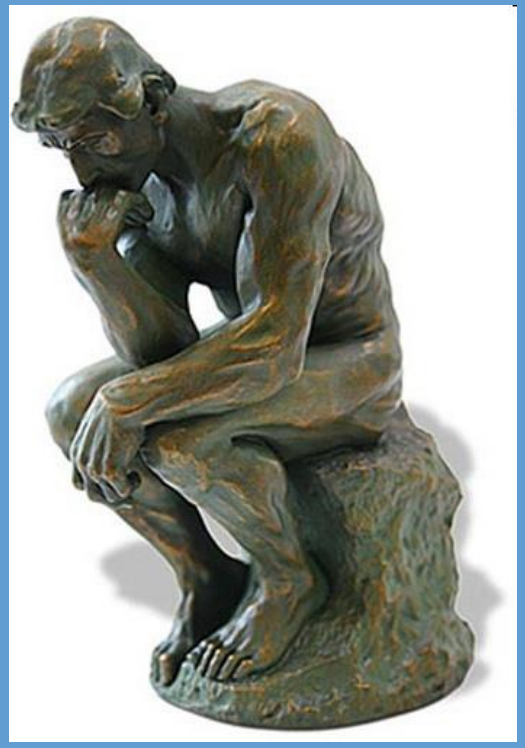
Lower Extremity

- Hip
  - Hip Distraction Mobilization
- Ankle
  - Talocrural Distraction Mobilization
  - Subtalar Inv/Ever. Mobilization
  - Cuboid Mobilization
  - Navicular Mobilization
- Knee
  - Tibio-Femoral Med/Lat Mobilization
  - Fibular Head Mobilization

Introduction & Objectives

Introduction & Objectives

- The participant will identify the history of thrust mobilization, current APTA policy, and the evidence available for techniques
- The participant will identify safety issues, indications, and contraindications for use of HVLA mobilizations
- The participant will identify clinical presentations, such as specific dysfunctions/pathologies, and when to apply the HVLA techniques
- The participant will demonstrate how to appropriately perform HVLA techniques on a lab partner, for multiple peripheral joint regions



Why Manual Therapy?

- Before learning anything new it is important to ask why?

- Brief introduction to include:
  - Name
  - Years of experience
  - Exposure to manual therapy
  - Reason for interest in this course

Overview of History of Manual Therapy

Manual Therapy Defined

- A clinical approach utilizing skilled, specific hands-on techniques, including but not limited to manipulation/mobilization used by physical therapists to diagnose and treat soft tissue and joint structures for the purpose of :
  - Modulating pain
  - Increasing ROM
  - Reducing or eliminating soft tissue inflammation
  - Inducing relaxation
  - Improving contractile and non-contractile tissue repair extensibility and/or stability
  - Facilitating movement
  - Improving function

- Stanley Paris

Overview of History of Manual Therapy

Early Evidence

460-385BC

- Hippocrates
- "The Father of Medicine"
  - Described a combination of traction (using levers) and pressure (manipulation) performed in prone on a table
  - Noted that these treatments should be followed by exercise
  - Observed in Roman times and Renaissance Medicine

18th Century

- Use of spinal manipulation was becoming less accepted among physicians
  - Bonesetters became the primary manipulators of 18th and 19th centuries in USA and Britain
  - **This gave rise to two other professions….**

Overview of History of Manual Therapy
Early Evidence

Osteopathy-"Law of the Artery"

- A.T. Still, 1874
- Still observed that when restricted joint motions were restored manually, certain disease conditions improved
- "I proclaimed then and there that all nerves depend wholly on the arterial system for their qualities such as sensation, nutrition and motion, even though by the law of reciprocity they furnish force, nutrition and motion to the artery itself."

Chiropractic-"Law of the Nerve"

- D.D. Palmer, 1895
- A vertebra out of alignment caused pressure on nerves, changing nerve impulses, and affecting visceral function leading to disease
- Credited with the terms:
  - Spinal subluxation (diagnosis)
  - Spinal adjustment (treatment)

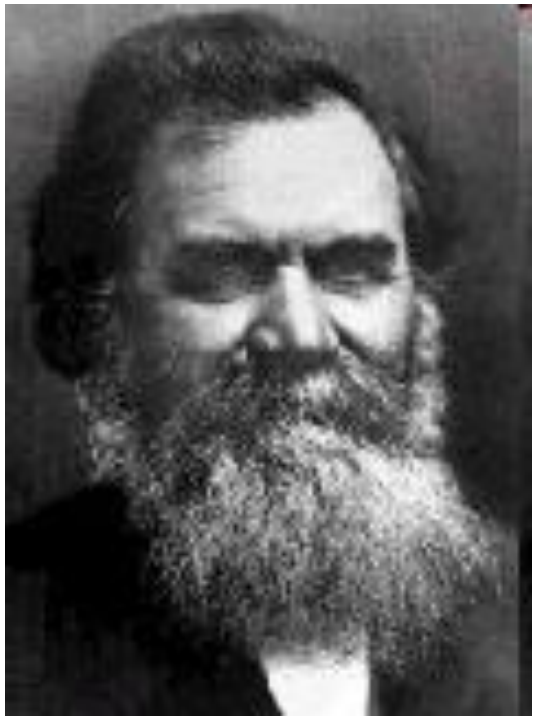
History of Manual Therapy

Osteopathy

“Of what value is a mind when placed in the brain of a coward? If mind is a gift of God to man for his use, let him use it. A mind is not in use when doing no good.”

-A.T. Still

History of Manual Therapy



Chiropractic

"I have answered the time-worn question — what is life?": "The dualistic system — spirit and body — united by intellectual life — the soul — is the basis of this science of biology"

-D.D. Palmer

Overview of History of Manual Therapy

Physical Therapy

- Founded in Britain in 1899 as “Physiotherapy”
- PT established in USA in 1921
  - Originally known as the “American Women’s Physical Therapeutic Association”
  - Goal: “to make available efficiently trained women to the medical profession”

Early PT Education

- Exercise, massage, manipulation, modalities
  - James Cyriax
    - Popularized the term “end feel”
    - Trained PT’s and felt that they were the most apt professionals to learn manipulative techniques
  - James Mennell
    - First to use the terms “manual therapy” and “joint play”

Overview of HVLA Mobilizations

Definitions

Mobilization and Manipulation are defined as:

Guide to Physical Therapy Practice	Dorland's Medical Dictionary
"A continuum of skilled passive movements to the joints and/or related soft tissue that are applied at varying speeds and amplitudes, including small amplitude/high velocity therapeutic movement."	"In physical therapy, the forceful passive movement of a joint beyond its active limit or motion"

MAMTC

Overview of HVLA Mobilizations

APTA Policy

- ***Guide to Physical Therapist Practice***
  - "Mobilization and manipulation are an integral part of the direct interventions listed under the section entitled, "Manual Therapy Techniques."
  - ***Guide*** describes PT scope of practice
  - Thrust joint manipulation/mobilization (HVLA) are **only** performed by PT's and cannot be delegated to PTA's
- **APTA Board of Directors**
  - Minimum required skills of entry-level PT's include thrust and non-thrust mobilization/manipulation

Overview of HVLA Mobilizations

Definitions

- HVLA = High Velocity, Low Amplitude
  - Applied as a thrust/impulse at physiological barrier/limit to motion
  - Must be performed **very quickly** and **precisely**
  - Typically <1/8” of amplitude
  - Subsequent joint cavitation

- Maitland Scale: Grade 5 Mobilization
  - AKA- “joint manipulation”
  - Terms are interchangeable as per APTA

Overview of HVLA Mobilizations

Proposed Effects

- Mechanical
  - Restore proper joint mechanics/joint play
  - Stretch/rupture intra-articular adhesions
  - Release of intra-articular inclusions (i.e. meniscus)
  - Alter positional relationships (of bones)
- Psychological
  - Key is patient selection
- Neurophysiological
  - Type III Mechanoreceptor activation
  - Reflex muscular inhibition
- Hydraulic
  - Changes in synovial fluid viscosity

Overview of HVLA Mobilizations

Proposed Effects

- Nitrogen normally dissolved in synovial fluid
- With HVLA, the joint surfaces are separated so fast that capsule cannot fill voluminous void
- Nitrogen gas forms into a bubble in the joint cavity to accumulate increased joint volume
- Bubble explodes, resulting in an audible cavitation or “pop”
- Can take minutes to hours for the gas to re-dissolve back into fluid

THE POP!

Overview of HVLA Mobilizations

Proposed Effects: “The Pop”

- According to newest research performed on MCP joints of hand with rapid cine MRI
- Popping sound occurs due to inception of joint cavity rather than collapse of pre-existing bubble
- Tribonucleation: process where opposing surfaces resist separation until critical point reached, then rapid separation occurs and sustained gas cavities formed
- Contrast with prior theory; supports much older, original theory from 1947

Indications/Contraindications/Precautions

Contraindications

not exhaustive list

- Fracture
- Anything that can weaken bone
  - Osteoporosis
  - Neoplasm
  - Osteomyelitis/infection
- Ligament tear/rupture→ instability
- Acute rheumatoid arthritis exacerbation
- Post-surgical
  - i.e. THA/ORIF

Contraindications

not exhaustive list

- Presence of other serious pathology
  - SCI/CVA
  - Active cancer
- Excessive pain/resistance (Fx?)
- Severe multi-directional spasm
- Joint ankylosis

Stoddard's Warning Signs

- **1.** Malignancy within the last 2 years
- **2.** Onset of back pain late in life with no history of symptoms
- **3.** Serious loss of spinal function, shock, vomiting after trivial spinal injury
- **4.** Intense pain requiring morphine for more than 48 hours
- **5.** Deformity and muscle spasm in an area other than lower cervical or lumbar regions
- **6.** Constitutional signs that accompany back pain, such as fever, weight loss, malaise, excess weakness.
- **7.** Loss of power too widespread to be a single nerve root lesion.
- **8.** Loss of sphincter control
- **9.** Continuous pain unrelated to posture.
- **10.** Normal erythrocyte sedimentation rate does not exclude disease entirely.

Contraindications

Would you perform HVLA mobilizations on this hand?

Precautions

not exhaustive list

- History of Cancer
- Pregnancy
  - Effects of relaxin hormone

    up to 6 weeks after nursing
- Chronic Pain disorders
- Psychological history
- Hunch/feel
- Emotionally dependent patients
- Age
- General health
- Pt. inability to relax
- Hypermobility

Indications

not exhaustive list

- Hypomobile joint
- Presence of joint dysfunction
  - 5 characteristics
- Neurophysiological effects secondary to pain
  - Tonic and Phasic Muscles
  - Effect on Sympathetic Truck
- Psychological effect
  - Perception of efficacy

Must get Patient Consent!

Proper Patient Selection

- Absolutely crucial to maximize likelihood of successful outcome
- Screen for Fear Avoidance Beliefs (FABQ)
- Screen for secondary gain issues
  - Hx of MVA, previous litigation
  - Worker's compensation
- Region-specific outcome measures can be helpful
  - SPADI, DASH, LE Functional scale
- When in doubt…

DON'T PERFORM HVLA!

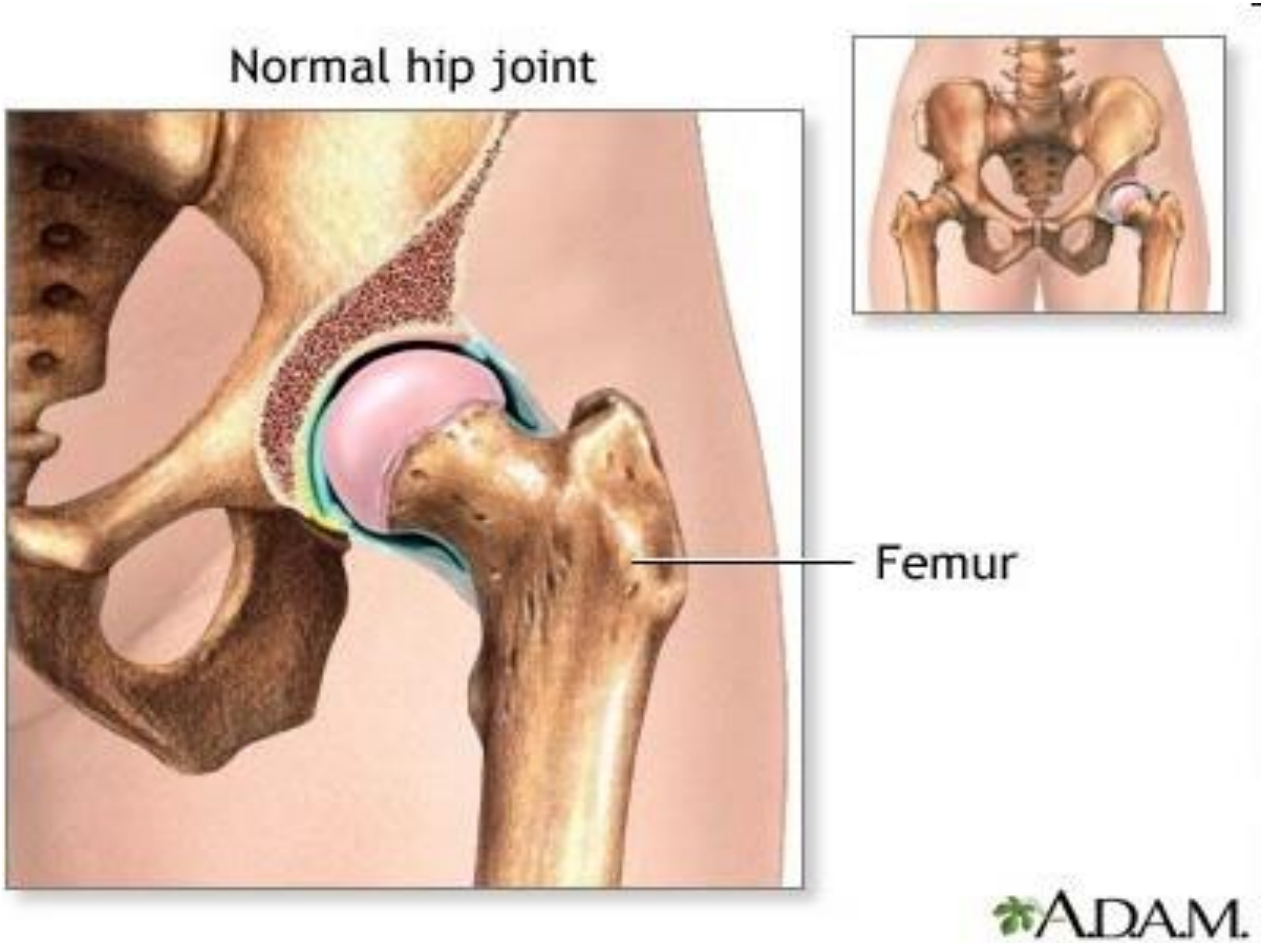
A.M. Break

10 minutes

Hip Mobilization

- Ball & Socket Joint
- Resting Position
  - 30 deg. flexion and abduction, 20 deg. ER
- Close Packed Position
  - Extension, abduction, and IR
- Capsular Pattern
  - Flexion, abduction, IR

Hip Distraction Mobilization
Anatomy



Hip
Clinical Applications

- Hip OA
- Hypomobility
- Internal Rotation loss
- Neurophysiological effects for muscle tone modulation
- Iliopsoas
- Gluteals
- Knee pain/dysfunctions
- PFPS, Knee Osteoarthritis
- SIJ/lumbar dysfunctions

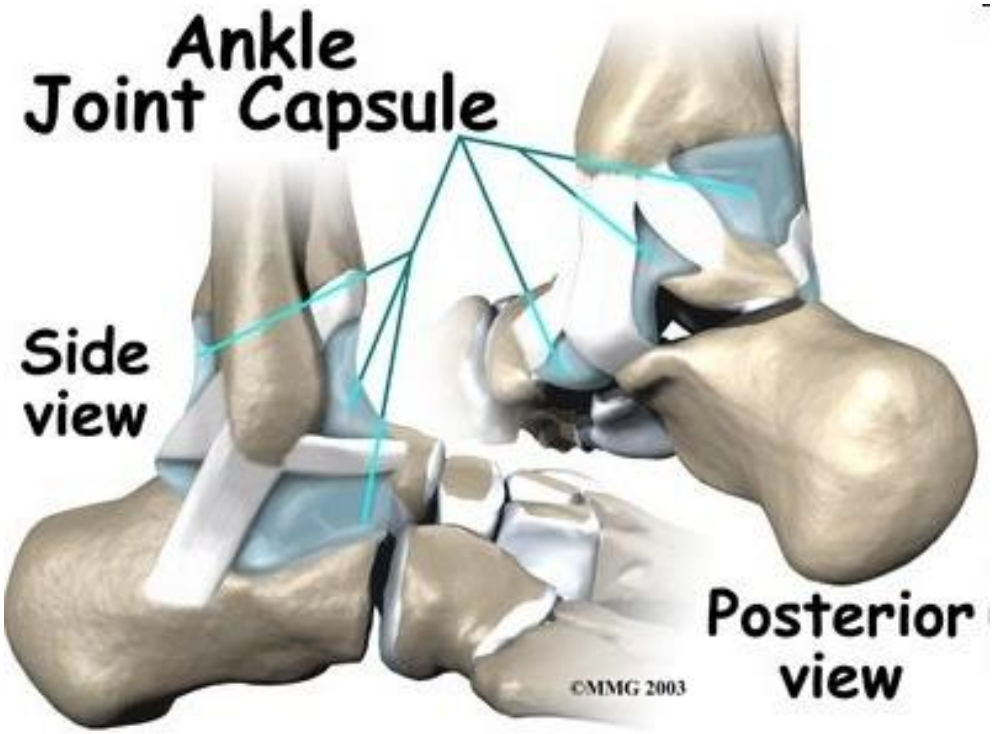
Hip Distraction Mobilization

Hip Distraction Mobilization

- Patient supine, involved side close to edge of table
- Banana belt placed around involved groin area and hooked onto ipsilateral side of top of table; slack taken up in belt
- PT grasps above malleoli without crossing fingers
- PT moves leg into resting position of hip
- Slack taken caudally without losing resting position
- Thrust is caudal, using a quick pull

Talocrural Joint Mobilization

Anatomy



Talocrural Distraction Mobilization

- Modified Sellar Joint
- Primary Motions: DF/PF
- Resting Position
  - 10 deg. PF, midway between inversion and eversion
- Close Packed Position
  - Maximal DF, Maximal inversion
- Capsular Pattern
  - PF > DF

Talocrural Distraction Mobilization

Clinical Applications

- Ankle Sprains
- Ankle Hypomobility/Equinus
- Plantar Fasciitis/heel pain
- Foot Pain
- Morton’s Neuroma
- Knee Pain

Talocrural Distraction Mobilization

Talocrural Distraction Mobilization

- Pt supine, foot over the end of the table
- Use a belt or another person to stabilize the distal lower leg
- PT holds just distal to the talocrural joint with hand-over-hand (do not interlace fingers)
- Foot held at 10 degrees of PF, neutral inv/ever
- Distract the joint by leaning back
- Thrust is provided in a purely caudal direction

Subtalar Joint Mobilization

Anatomy

Subtalar Joint Mobilization

- Modified Sellar Joint
- Primary Motions: Inversion/Eversion
- Resting Position
  - 10 deg. PF and midway between maximal inversion and eversion
- Close Packed Position
  - Maximal inversion/supination
- Capsular Pattern
  - Varus > Valgus

Subtalar Joint Mobilization
Clinical Applications

- Ankle Sprains
- Ankle (subtalar) hypomobility
- Plantar Fasciitis/heel pain
- Excessive Pronation (of forefoot)
- Lack of single limb stance control
- Biomechanical connection with hip joint for control of frontal/transverse plane stability in lower extremity

Subtalar Joint Mobilization
Eversion

Subtalar Joint Mobilization
Eversion

- Pt supine, PT sits on the plinth with the patient's thigh stabilized against PT's ribs
- PT holds around the talocrural joint with bilateral hands
- Take up slack w/ thumbs on calcaneus into eversion (ulnarly deviate the wrists) and get a firm grip on foot/ankle
- Thrust is provided by whipping the foot into eversion, straight down to the floor

Subtalar Joint Mobilization

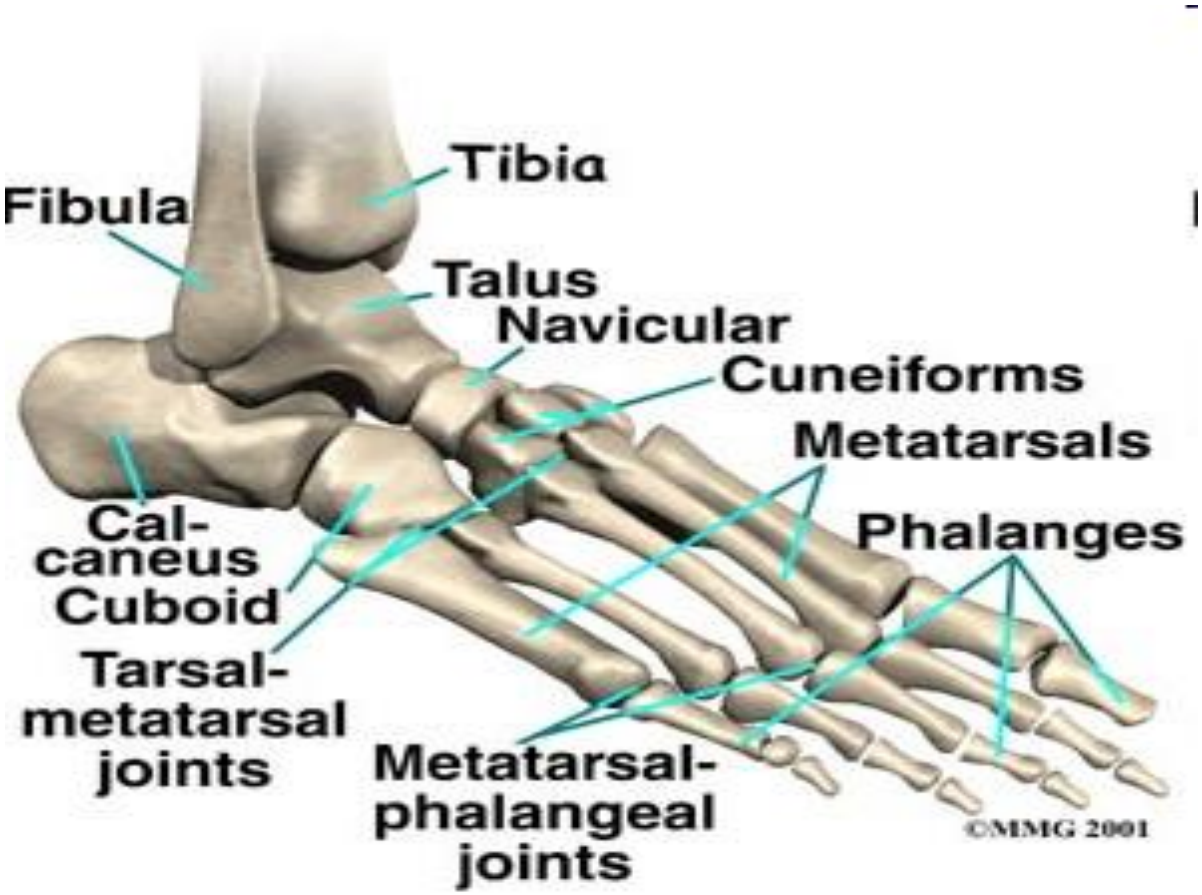
Inversion

Subtalar Joint Mobilization
Inversion

- Pt sidelying with involved side up
- PT sits on the plinth with the patient's thigh stabilized against PT's ribs
- PT holds around the talocrural joint with bilateral hands
- Take up slack w/ thumbs on calcaneus into inversion (ulnarly deviate the wrists) and get a firm grip on foot/ankle
- Thrust is provided by whipping the foot into inversion, straight down to the floor

Cuboid Mobilization

Anatomy



Cuboid Mobilization

- Part of Talocalcaneonavicular Complex & Midtarsal Joints
- Resting Position
  - 10 deg. PF and midway between maximal inversion and eversion
- Close Packed Position
  - Maximal inversion/supination
- Capsular Pattern
  - Varus > Valgus

Cuboid Mobilization
Clinical Application

- Ankle/Foot Sprains
- Foot Pain
- Excessive Pronation (of forefoot)
- Peroneal Muscle issues
- Morton’s Neuroma

Cuboid Mobilization

Cuboid Mobilization

- Patient prone with feet off table edge
- PT places the thumbs on the plantar aspect of the cuboid and grasps around dorsum of involved foot
- Slack is taken up by moving the foot into neutral DF (~0 deg.) and slight inversion
- PT squeezes foot and cuboid to further take slack
- Thrust is provided by pushing with the thumbs in the plane of the leg and slightly laterally (be sure not to force the foot into excessive PF or Inv)

Navicular Mobilization

Navicular Mobilization

- Perform the same way as cuboid
- Hand placement is on navicular
- Thrust is same as for cuboid
- Used to treat a plantarly subluxed navicular and/or limited dorsal navicular glide (traumatic vs. adaptive)

Tibio-Femoral Mobilization

- Bicondylar Complex Joint
- Resting Position
  - 25 deg. flexion
- Close Packed Position
  - Full extension and ER of tibia
- Capsular Pattern
  - Flexion loss > Extension loss

Tibio-Femoral Mobilization Anatomy

Tibio-Femoral Mobilization

Clinical Application

- Knee Sprains
- Knee Pain (especially at joint line)
- Knee Hypomobility (test IR/ER and med/lat glides)
- Knee OA

Clinical Pearls

- Needs to be performed in direction of glide hypomobility
- Often Correlates with rotational loss in same direction, i.e. loss of medial rotation with loss of medial joint play

Knee Mobilization

Medial Thrust

Knee Mobilization
Lateral Thrust

Knee Mobilization

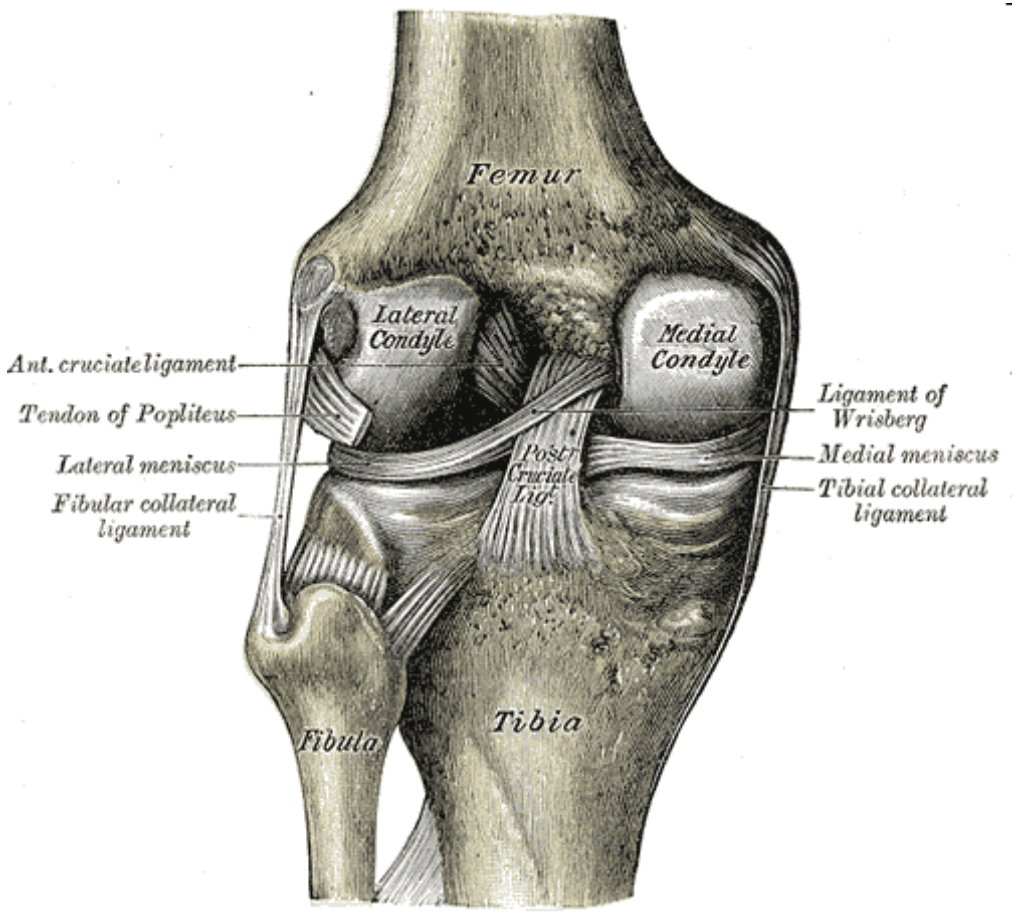
- Patient supine with knee flexed to ~25 deg.
- PT holds patient's leg off the table, holding patient's malleoli with PT's knees
- PT distracts the involved knee slightly by leaning back - Contact is made just above and below the knee joint line with the web space of the thumb and index finger
- Elbows point out so they are perpendicular to the knee
- Medial glide: stabilize with the medial femur and thrust the tibia medially
- Lateral glide: stabilize the lateral femur and thrust the tibia laterally

Fibular Head Mobilization

- Proximal Tibio-Fibular Joint
  - Modified Ovoid Joint
  - Works in conjunction with distal T-F joint
- Primary Motions: Pronation/Supination
  - Anterolateral-posteromedial joint line
  - Pronation: fibula glides superoposteromedially
  - Supinaton: fibula glides inferoanterolaterally
- Attachment point of peroneals, LCL, and biceps femoris tendon
- Common peroneal nerve lies in close proximity

Fibular Head Mobilization

Anatomy



Fibular Head Mobilization
Clinical Application

- Ankle Sprains
- Knee Sprains
- Knee Pain/Hypomobility
- Excessive pronation/supination
- Foot Pathologies
- Peroneal Nerve issues/ANTT
- Peroneal muscle issues
- Hamstring (biceps femoris) issues

Fibular Head Mobilization
Position 1

Fibular Head Mobilization
Position 1

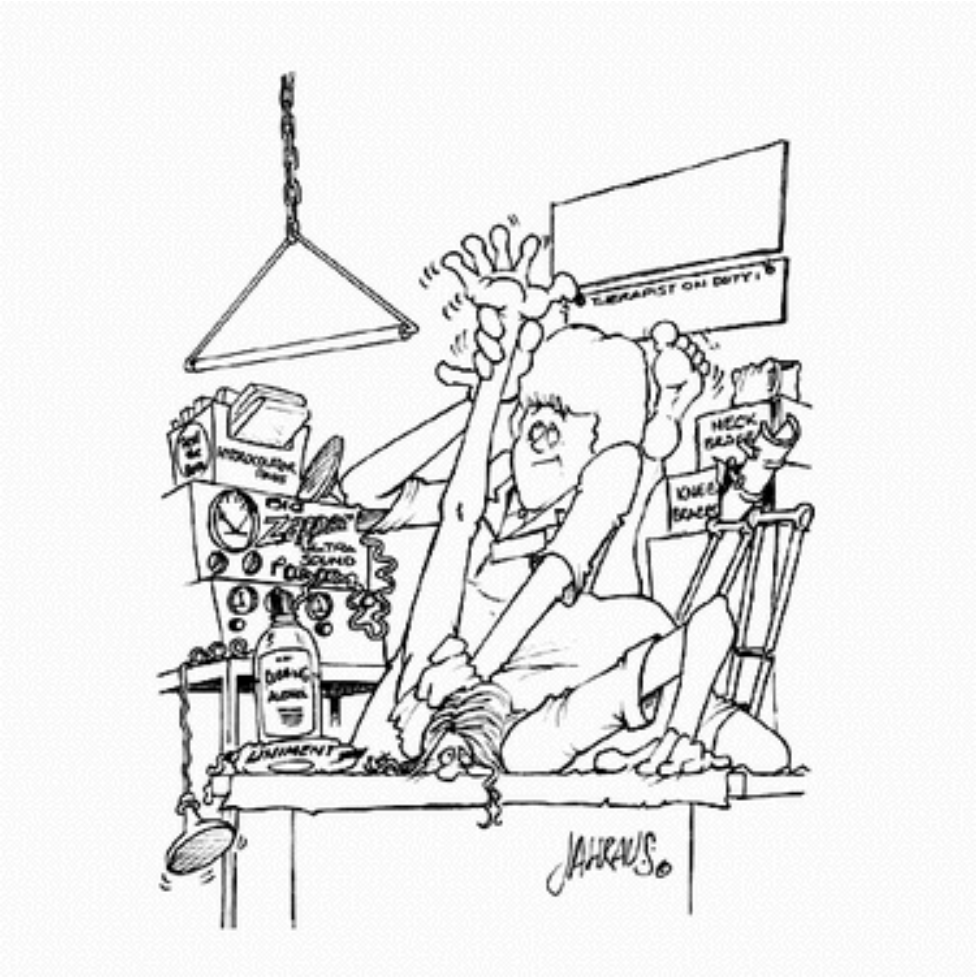
- Patient sidelying
- PT stands opposite the treatment side
- PT contacts the posterior aspect of fibular head with the thenar eminence (if right leg use right hand, and left leg use left hand to mobilize)
- Stabilize by grasping around ankle/foot, DF ankle then externally rotate the leg/knee
- Thrust is provided in an anterior and slightly lateral direction

Fibular Head Mobilization
Position 2

Fibular Head Mobilization
Position 2

- Patient supine with flexed knee
- PT stands in front of knee to be treated
- PT contacts the posterior aspect of fibular head with the thenar eminence (of cranial hand) and radial deviates wrist slightly to pull fibular head anterior and create a skin lock
- Caudal hand grasps above malleoli, laterally rotates the knee, then flexes knee until barrier/end point is felt
- Thrust is provided with caudal hand in posterior and slightly lateral direction

Glenohumeral Joint Mobilization

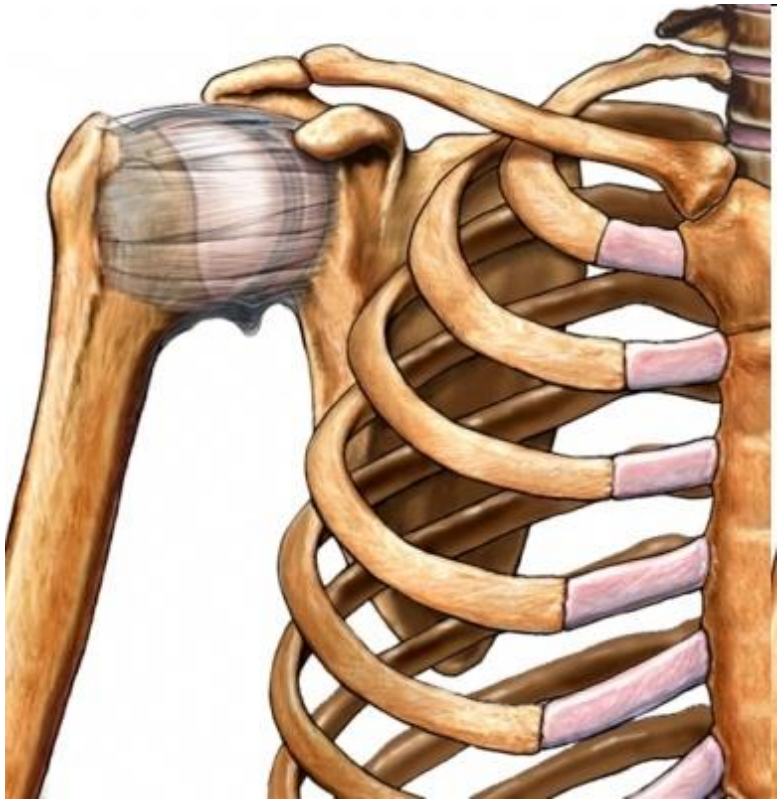


Glenohumeral Joint Mobilization

- Ball & Socket Joint
- Resting Position
  - 55 deg. abduction, 30 deg. horizontal adduction
- Close Packed Position
  - Full abduction and ER
- Capsular Pattern
  - ER, abduction, IR

Glenohumeral Joint Mobilization

Anatomy

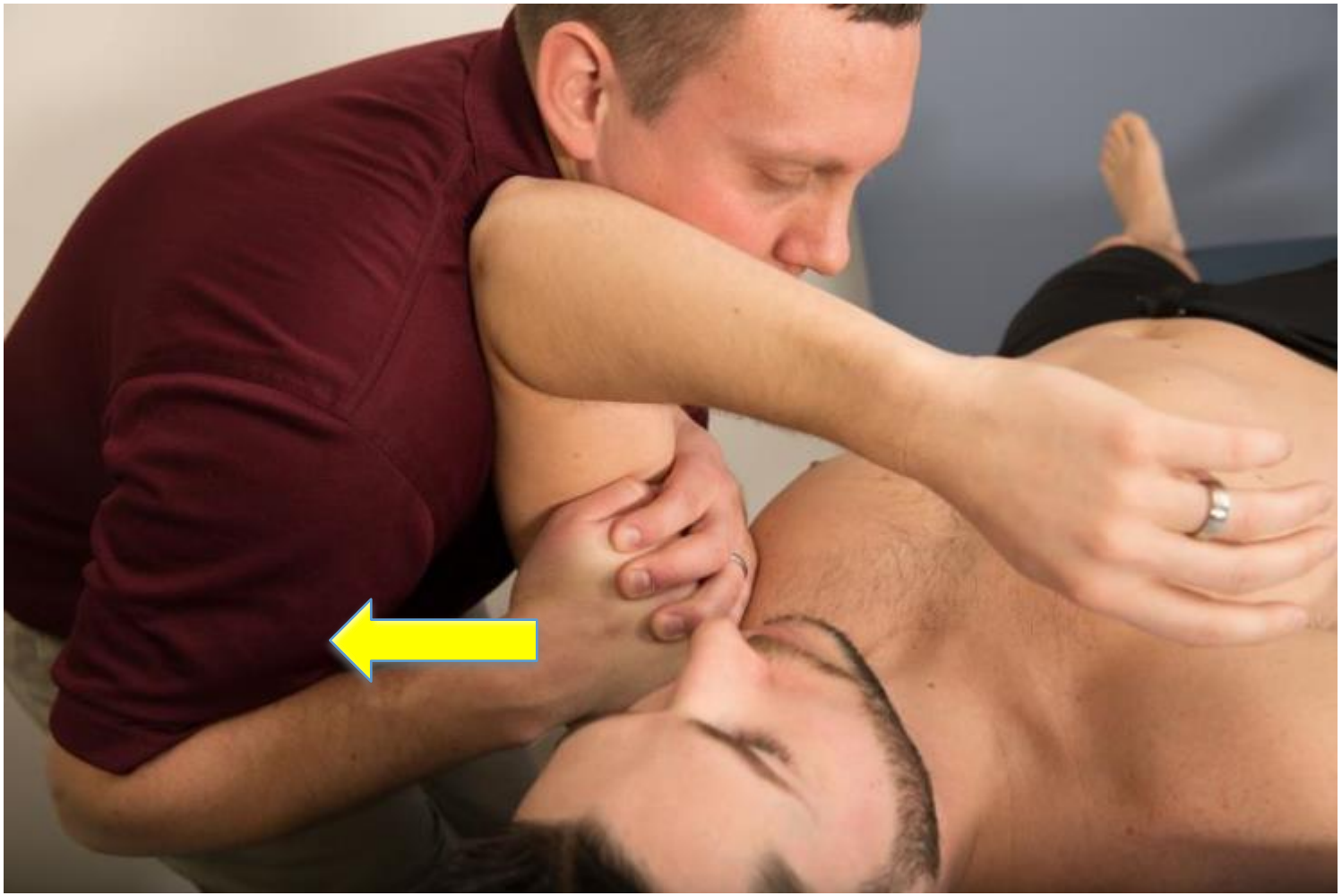


Glenohumeral Joint Mobilization
Clinical Application

- Impingement Syndrome
- Rotator Cuff Tendinopathy
- Adhesive Capsulitis
- Hypomobility/stiffness
- Adjunctive Treatment (anecdotal):
  - Thoracic Outlet Syndrome
  - Cervical spine dysfunctions
  - Elbow dysfunctions

G-H Joint Mobilization

Lateral Glide



G-H Joint Mobilization

Inferior Glide

G-H Joint Mobilization

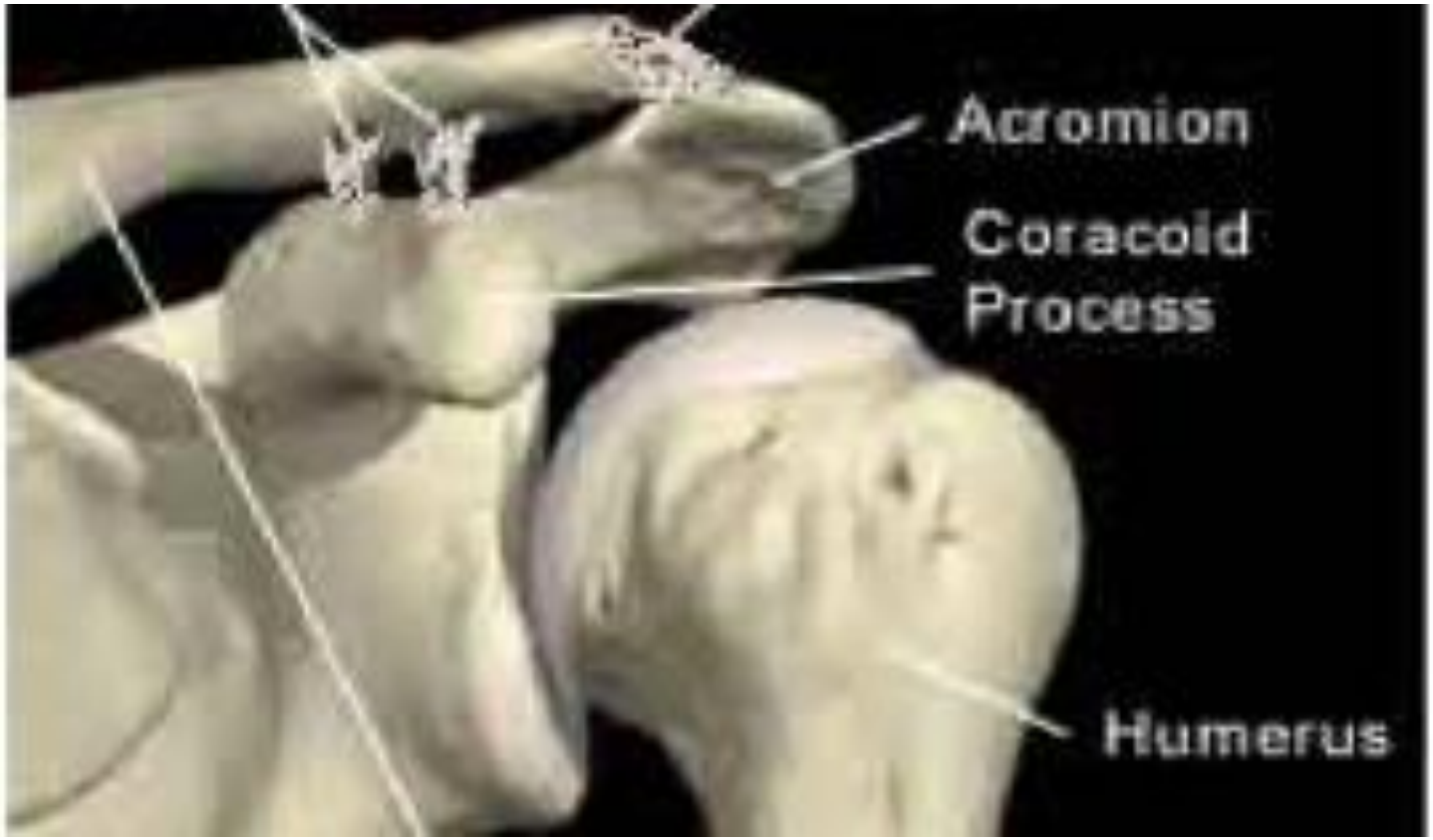
- Patient supine, lying close to table edge near PT
- Patient's elbow and shoulder flexed to 90 deg.
- PT grasps proximal arm as close to GHJ line as possible with both hands
- For Lateral Glide: take up slack laterally with arms and via body weight shift- thrust laterally
- For Inferior Glide: take up slack inferiorly with arms and via body weight shift- thrust inferiorly

AC Joint Mobilization

- Complex Modified Ovoid Joint
- Resting Position
  - Arm resting at side
- Close Packed Position
  - ? Full extension
  - ? Abduction 90 deg.
- Capsular Pattern
  - Pain at end range

AC Joint Mobilization

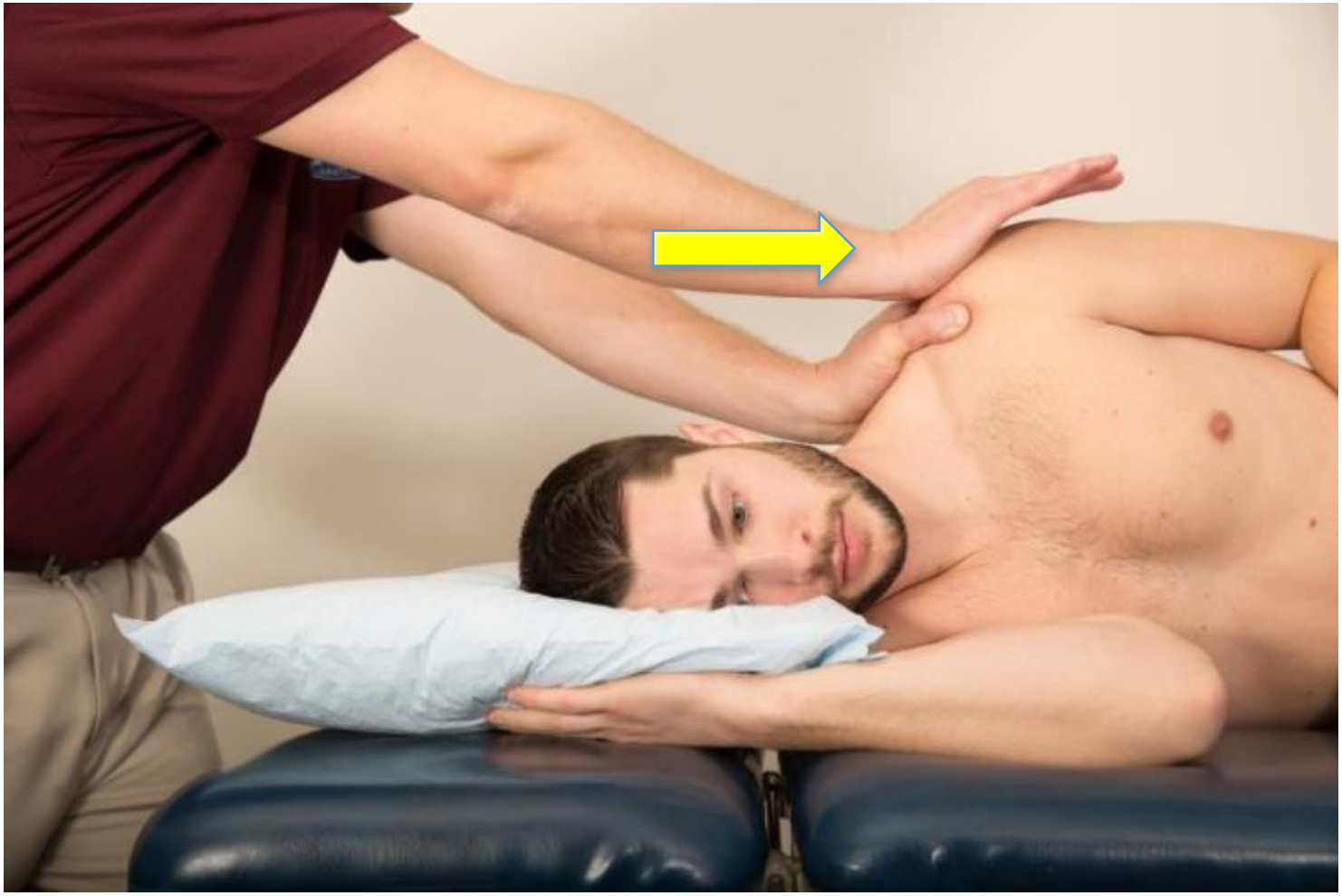
Anatomy



AC Joint Mobilization
Clinical Applications

- Impingement Syndrome
- AC Joint Sprains
- Rotator Cuff Tendinopathy
- Hypomobility/stiffness (post immobilization)
- End ROM pain (ERP) with flexion/extension
  - ERP Flexion = lack of posterior clavicular glide
  - ER Extension = lack of anterior clavicular glide

AC Joint Distraction Mobilization



AC Joint Distraction Mobilization

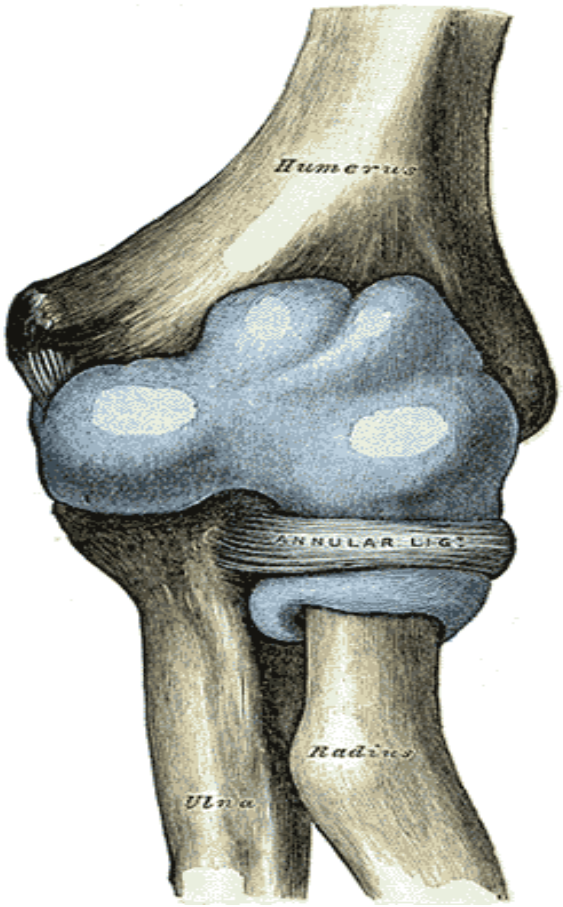
- Patient sidelying (Rx side up), arm at side
- PT grasps clavicle and “frames” with fingers
- Opposite hand hypothenar eminence lines up with ACJ line
- PT delivers a short, quick percussion thrust to the acromion in an inferior direction

Humero-Ulnar Joint Mobilization

- Modified Sellar Joint
- Resting Position
  - 70 deg. Flexion, 10 deg. supination
- Close Packed Position
  - Full extension
- Capsular Pattern
  - Flexion loss > Extension loss

Humero-Ulnar Joint Mobilization

Anatomy



Humero-Ulnar Joint Mobilization
Clinical Applications

- Lateral Epicondylalgia
- Elbow Sprains (typically FOOSH MOI)
- Elbow Hypomobility
- Ulnar Nerve ANTT
- Wrist Pain (radial side)
- DeQuervain's Syndrome Presentation
- Possible anterior shoulder pain (throwing athletes)

Humero-Ulnar Joint Mobilization

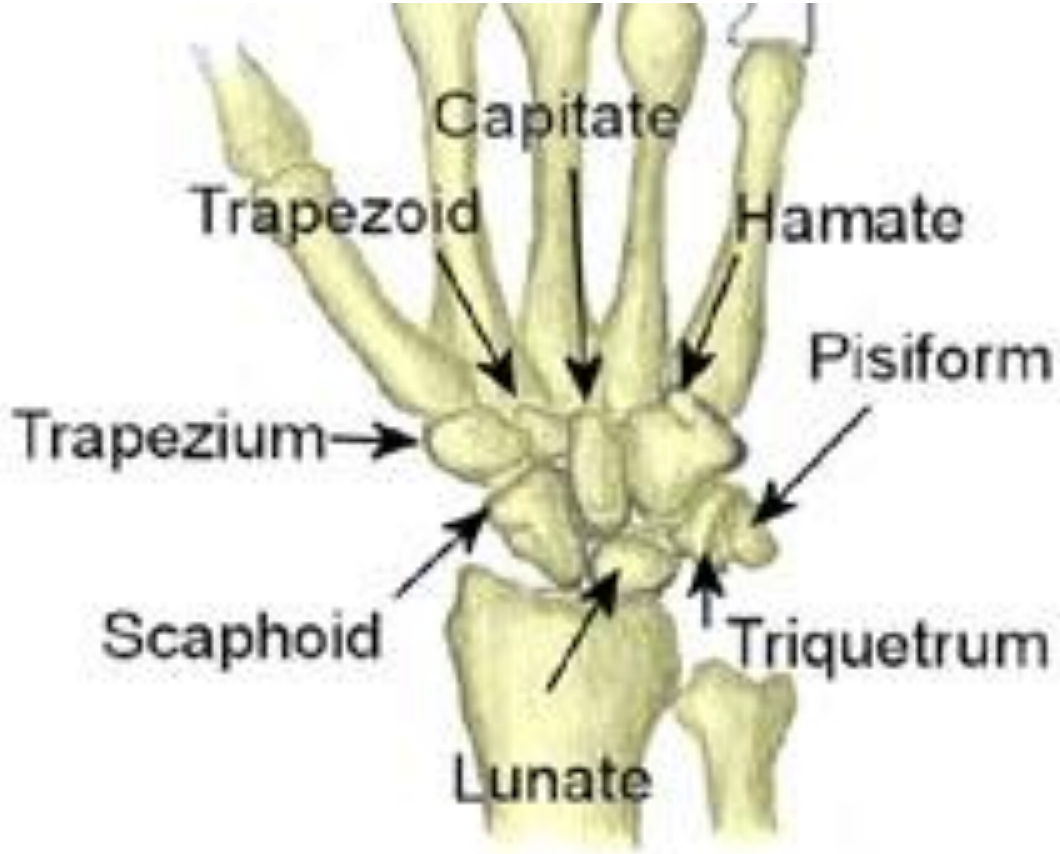
Humero-Ulnar Joint Mobilization

- Patient supine, Rx arm to side of table
- PT sits between patient body and arm
- PT abdomen contacts shaft of ulna
- PT cranial hand hypothenar eminence contacts medial epicondyle
- Caudal hand stabilizes lateral elbow
- Patient elbow should be ~10 deg. shy of full extension
- Slack taken up into flex/ext, abd/add, pron/sup, then PT to rotate trunk to further engage barrier
- Thrust laterally with cranial arm and some further trunk rotation

Wrist Mobilization

- Ellipsoid Joint (radio-carpal joint)
- Plane/Gliding Joints (inter and mid-carpal joints)
- Resting Position
  - Slight extension, slight ulnar deviation
- Close Packed Position
  - Full extension, full radial deviation
- Capsular Pattern
  - Equal limitation in flexion/extension, minimal limitation in UDev/RDev

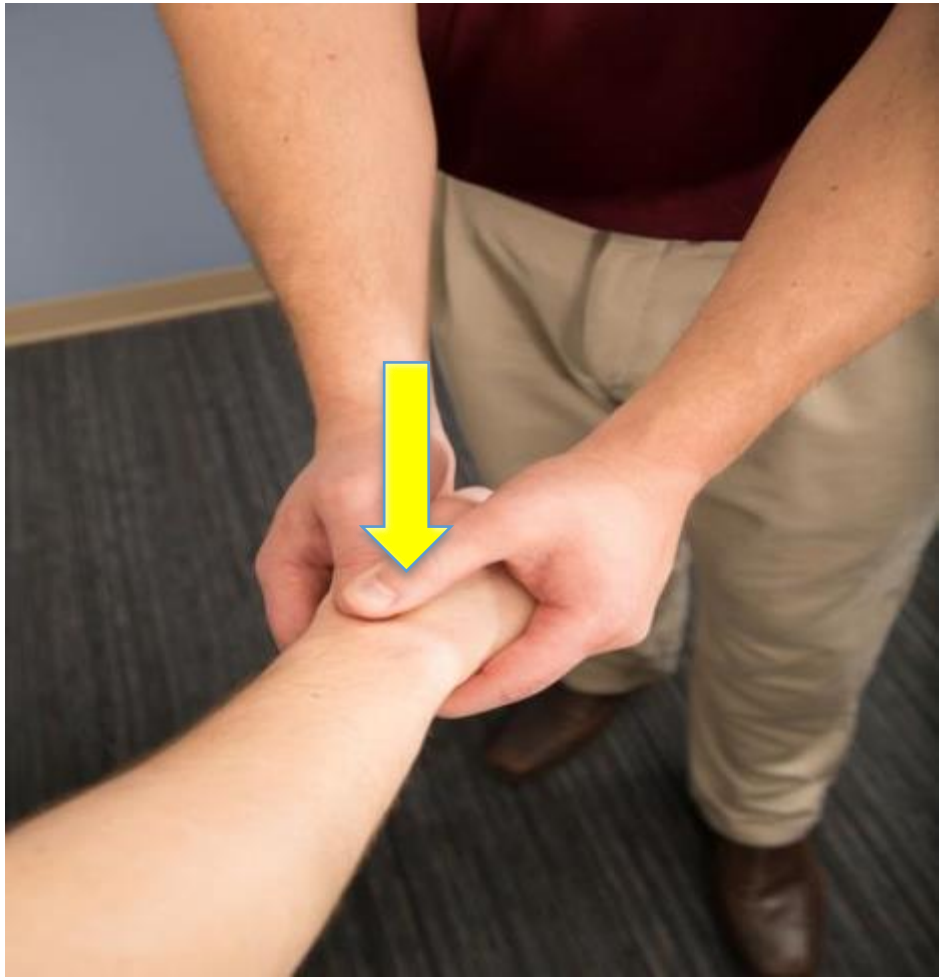
Wrist Mobilization
Anatomy



Wrist Mobilization
Clinical Applications

- Wrist Sprain
- Hypomobility/stiffness (i.e. post-immobilization)
- Carpal Tunnel Syndrome (i.e. ventrally subluxed lunate)
- Ulnar Tunnel Syndrome
- Lateral Epicondylitis
- DeQuervain's Syndrome

Wrist Mobilization



Wrist Mobilization

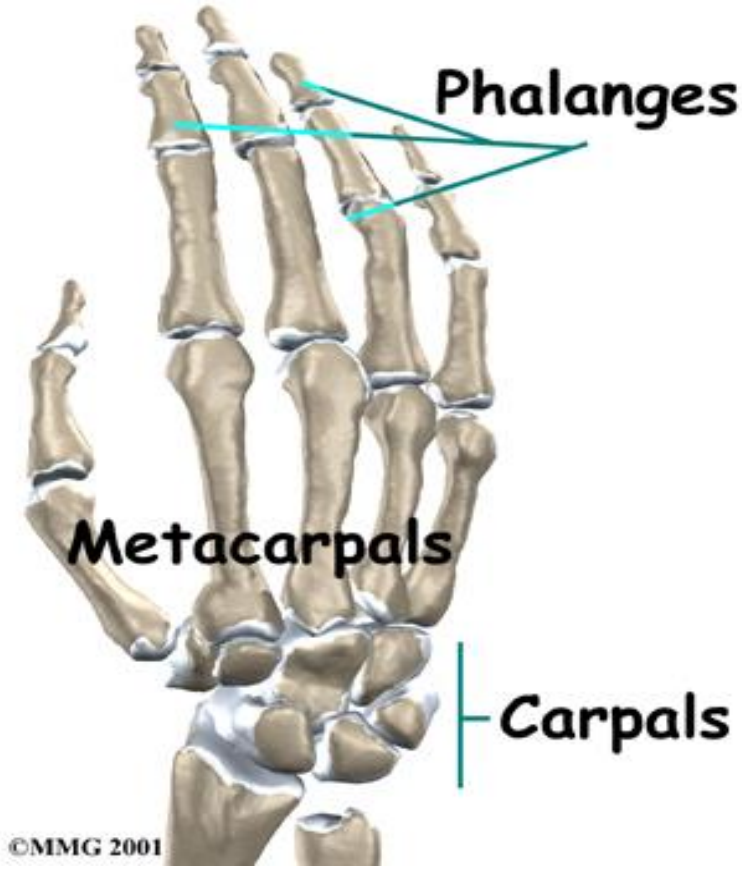
- Patient seated/standing
- PT grasps wrist with forearms pronated and thumbs on desired carpal
- For Volar Thrust:
  - Patient's forearm pronated
  - PT thumbs on carpal, squeeze carpal with thumbs and patient's wrist with fingers (to take up slack)
  - Thrust toward floor with quick "whip"
- For Dorsal Thrust
  - Patient's forearm supinated
  - PT thumbs on carpal, squeeze carpal with thumbs and patient's wrist with fingers (to take up slack)
  - Thrust toward floor with quick "whip"

Thumb Carpo-Metacarpal
Distraction Mobilization

- Sellar Joint
- Resting Position
  - Midway between extension, flexion, abduction, adduction
- Close Packed Position
  - Full thumb adduction, full wrist extension and radial deviation
- Capsular Pattern
  - Abduction, extension

Thumb Carpo-Metacarpal Distraction Mobilization

Anatomy



Thumb Carpo-Metacarpal Distraction Mobilization

Clinical Applications

- Hypomobility/stiffness (i.e. post-immobilization)
- Post trauma/thumb sprain
- DeQuervain's Syndrome
- Wrist sprain

Thumb Carpo-Metacarpal Distraction Mobilization

Thumb Carpo-Metacarpal Distraction Mobilization

- Patient standing
- PT grasps desired thumb with caudal hand pronated, thumb on CMC joint line, and fingers flexed around patient's thumb
- Cranial hand hypothenar eminence contacts caudal hand thumb and CMC joint line
- Slack taken up inferiorly with cranial hand
- Thrust with cranial hand straight down to floor

Case Study #1

- 43 y/o male; no significant PMHx
- MOI-1 mo. ago: FOOSH from trip/fall over wire at home; immediate pain; slightly better now
- C.C.- R lateral elbow and R dorso-lateral wrist pain
- Denies any paresthesias/radiating pain/night pain
- Aggravating factors: forceful gripping, use of tools, prolonged lifting (mechanic- OOW at present due to injury)
- Easing factors: rest

Questions??

- Does this pt appear to be a candidate for HVLA mobs.?
- What else do you need to know?
- What mob(s). would you choose?

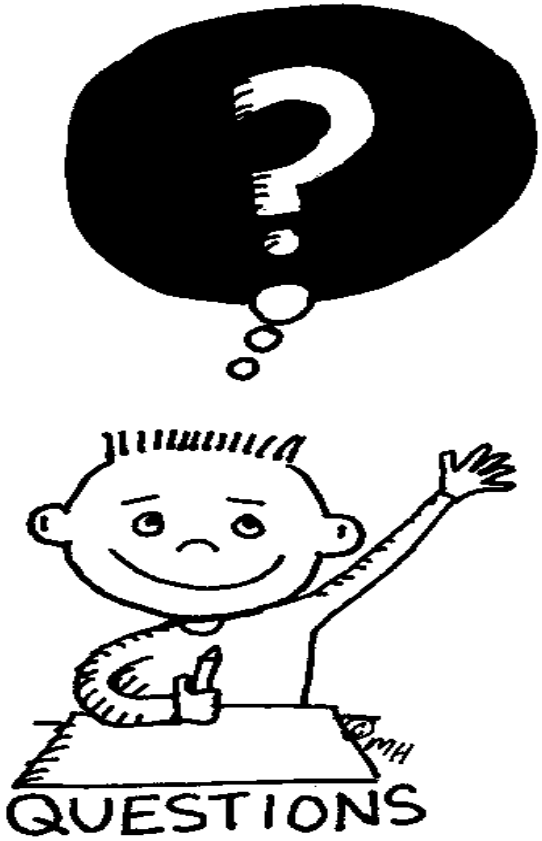
Case Study #2

- 28 y/o female; no significant PMHx
- MOI- slip and fall on wet floor 6-mo. ago: rolled R ankle, twisted R knee; overall 50% better since the injury
- C.C.- aching pain in R antero-lateral ankle & R lateral knee
- Denies any paresthesias/radiating pain/night pain
- Aggravating factors: prolonged standing/walking, ankle inversion, pivoting/twisting of the knee, squatting
- Easing factors: stretching R hamstring, rest/elevating leg after use

Questions??

- Does this pt appear to be a candidate for HVLA mobs.?
- What else do you need to know?
- What mob(s). would you choose?

Review, Q & A, Discussion



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Appendix:

Joint Biomechanics Basics

Joint Biomechanics Basics

- Close Packed Position:
  - Joint surfaces have maximal congruency
  - Maximal joint surface compression
  - Capsule and ligaments maximally spiralized and tensed
  - No distraction possible and no further motion possible
  - Intracapsular space and volume is minimal
- Resting (loose packed) Position:
  - Joint surfaces have least congruency
  - Least joint compression
  - Capsule and ligaments maximally relaxed
  - Maximal distraction possible and greatest motion available
  - Intracapsular space and volume is maximal
- Capsular Pattern:
  - Irritation of the joint capsule or the synovium producing characteristic, proportional limitation of movement.